MA 3232- Numerical Analysis
Prerequisite Skills

The student wishing to take this course should possess the following minimal skills:

1. Calculus:

a. Know the definition of *limit*, and be able to take the limit of a given expression.

b. Give and use geometrical interpretations of the derivative and integral.

c. Find, from memory, the derivatives of elementary functions such as sines, cosines, natural logarithms, exponentials, and polynomials.

d. Find, using the sum, quotient, product, and chain rules, the derivatives of combinations or compositions of elementary functions.

e. Find, from memory, the integrals of elementary functions.

f. Find, using substitution, change of variables, or the addition properties of the integral, the integrals of given combinations/compositions of elementary functions.

g. State the definition of *convergence*, and use that definition to find the limit (if any exists) of a given infinite series/sequence.

h. Find the Taylor Series expansion of a given function, and, using the remainder theorem, estimate the error when a function is approximated by a finite number of terms of that series.

2. Linear Algebra:

a. Use matrix/vector notation to express the elements of a matrix, and to denote and find matrix sums, matrix products, partitioned matrices, systems of linear equations, etc.

b. Solve by hand, using Gaussian elimination, a given system of up to four linear equations in four unknowns, and determine whether a unique solution exists.

c. Find by hand, the inverse of a given nonsingular matrix of size up to four by four.

d. Find by hand, the eigenvalues and eigenvectors of a given matrix of size up to four by four.

3. Ordinary Differential Equations:

a. Find the general solution to a given first order linear, separable, or exact ordinary differential equation (ODE).

b. State the geometrical interpretation of initial condition for a first order ODE, and, given an appropriate initial condition, apply it to find a particular solution to a given ODE.

c. Given a n^{th} order scalar ODE, rewrite it in the form of an equivalent system of first order ODE's.

4. Computer Programming:

a. Write programs including input/output operations, loops, conditional ("IF") statements, and calls to subroutines or function subprograms in MATLAB (preferred).

b. Be familiar with MAPLE.

Suggested References:

Calculus - **Calculus**, by Thomas/Finney
Chapters 1-14

Linear Algebra - **Elementary Linear Algebra w/ Applications**, by Leon

Ordinary Differential Equations - **Elementary Differential Equations and Boundary Value Problems**, by Boyce and Di Prima:
Chapter 1-2

Zh - 11/03